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ENGINEERED LONG RANGE MODERNIZATION PROGRAM

FOR

THE U.S. NAVAL SHIPYARDS

PHASE II REPORT

VOLUME 5

SAN FRANCISCO BAY NAVAL SHIPYARD

HUNTERS POINT SITE

PREPARED FOR

DEPARTMENT OF THE NAVY

NAVAL SHIP SYSTEMS COMMAND

WASHINGTON, D. C.

Contract No. NObs-35(A)

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October 1967

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V. INDUSTRIAL PRODUCTION EQUIPMENT AND FACILITIES

A. GENERAL

Virtually all the production shops at this shipyard will have inadequate shop space in which to properly perform their assigned functions at the level of the presently projected workload. However, the space deficiencies can be corrected by reassignment of existing facilities, the construction of new buildings for the EWP/Electrical Group, the Sheetmetal Shop (17), the Forge Shop (23), and the extension of the Structural Shop (11) building.

The shipyard production complex does not include a foundry, pattern shop, or a galvanizing operation, nor is it proposed to provide the shipyard with facilities and equipment for these operations.

2. Shop 11 - Shipfitters

a. Existing Conditions

Shop 11 is responsible for the shipyard's structural and plate fabrication. Its functions include preparation of templates, heavy cutting and burning, forming and assembly, and general machining.

Shop 11 occupies a total of 251,700 sq ft in one major facility (Bldg 411) and six minor facilities (Bldg 128, 156, 368 and miscellaneous areas). The production work is done in Bldg 411; the other buildings are field support facilities.

Existing conditions contribute to the following principal deficiencies in Shop 11:

- The shop lacks sufficient covered assembly areas to meet the projected requirement for welding of large assemblies.
- The work to be performed in this shop will include all sizes of weldments up to and including carrier deck overhangs and carrier plane elevators. Some of these weigh as much as 115 tons. Within the last two years, because of the advent of high strength steel and aluminum alloys in the design of these conversions, a requirement has developed for a controlled atmospheric environment to perform the necessary welding. In order to obtain qualified welds, the atmospheric temperature must be maintained within specific limits and this control is not attainable in an outside location exposed to the elements.
- Present equipment arrangement is not conducive to an efficient production flow.
- Crane service is inadequate to handle large assemblies.
- Presses, cut-off machines, a radial drilling machine and a furnace are worn beyond economical repair. Press brakes are unnecessarily duplicated.

b. Current Planning by the Shipyard

Seven P-Sheets have been prepared by the shipyard requesting several types of presses.

3. Shop 17 - Sheetmetal

a. Existing Conditions

The main function of Shop 17 is the fabrication of sheetmetal components for ventilation, ducting, furniture, electric cabinetry and galley equipment.

Shop 17 occupies a total of 50,700 sq ft in five buildings (217, 128, 235, 258, 275). Small parts production is in Bldg 275, larger parts production and assembly work is in Bldg 217, and the remaining three buildings are used for waterfront support activities. The following principal deficiencies were noted in Shop 17:

- Shop space is too small and too scattered for efficient operations. Straight-line workflow is impossible in the separated buildings; handling of sheetmetal is complicated by narrow aisles and equipment congestion; and auxiliary services such as welding are dispersed throughout the shop. Proper supervision and coordination of work is consequently difficult.

- Assembly and laydown space is particularly lacking in the shop buildings. Bldg 217, for example, has insufficient clearance between columns for efficient layout on in-process assemblies.

- Storage space is inadequate or dispersed. Specifically, there is no storage space for finished products or for interference material (material which is removed to provide access to parts needing repair or replacement). Raw material is stored outside, where it is subject to substantial weather damage.

- Machine tools are duplicated between Shop 17 and the strapping section of Shop 51 (Electrical).

b. Current Planning by the Shipyard

Ten P-Sheets have been generated by the shipyard, requesting press brakes, bending rolls, shears, and punches. In addition, a shear has been obtained from Mare Island.

2. Shop 06 - Central Tool

a. Existing Conditions

The primary function of Shop 06 at Hunters Point is the design and manufacture of special tools, dies and fixtures used in the shipyard. In addition, the shop is responsible for the maintenance of machine tools and other production equipment. The control, issuance and repair of electrical, mechanical and pneumatic portable tools is also a responsibility of the Central Tool Shop.

Shop 06 presently occupies a total of 93,500 sq ft of space in eight separate buildings. Main shop facilities are located in Bldgs 134, 211, 230, 231, 251, 270, 272 and 366.

Existing conditions have contributed to the following principal deficiencies in Shop 06:

- In general, funding for Shop 06's repair and maintenance functions has been inadequate. Consequently the shop lacks the capability to perform these functions properly; equipment maintenance programs have been inadequate, and the shop does not have sufficient funds to maintain a staff of personnel qualified for work on hydraulic controls and NC machines. In view of the general tendency toward automated equipment, this deficiency will have an increasingly larger effect on shipyard production.

- The present scattered locations of Shop 06 result in excessive personnel travel and inhibit inventory and personnel control.

- Storage facilities for portable equipment, such as portable milling and facing machine tools, are insufficient, and there is no central location from which control over inventory can be exercised.

- The space allocation for the maintenance and repair of production machinery and portable electrical and pneumatic equipment is inadequate. Consequently, a large percentage of this equipment is inoperative at any given time.

- Of the 123 pieces of equipment in the Shop 06 inventory, some 49 pieces are badly worn or obsolete. Production to acceptable tolerances with this equipment is difficult.

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3. Shop 23 - Forge

a. Existing Conditions

The Forge Shop provides general forging and heat-treating services for the shipyard, including stress relief, annealing and hardening. The shop also repairs and manufactures chains and hooks for the Riggers Shop. A variety of general forging and heat-treating equipment is used in the shop, including furnaces, quenching tanks and forging hammers. Shop 23 occupies 15,500 sq ft in Bldg 241.

The following principal deficiencies were noted in Shop 23:

- Bldg 241 is of wood construction and presents a serious fire hazard.
- Crane service in the storage yard east of Bldg 241 is inadequate. The two free standing jib cranes cannot reach the entire area.
- The heat-treating and billet heating furnaces are generally inadequate and require improvements in control and capacity.
- Lack of available manpower and funds have caused deficiencies in the maintenance program.

b. Current Planning by the Shipyard

Two P-Sheets for new equipment have been prepared by the shipyard requesting a forging hammer and a nitriding furnace.

c. Alternates Considered

Two alternates were considered for Shop 23. The first alternate calls for maintaining Shop 23 operations in Bldg 241, with the wooden sections of the building to be demolished a section at a time and replaced with steel structures. The estimated cost of this construction is $311,000.

The second alternate stipulates the relocation of the shop to an entirely new fireproof building. The estimated costs of constructing this new building and of relocating the shop equipment are considerably higher than of those involved in the first alternate.

5. Shop 38 - Outside Machine Shop

a. Existing Conditions

The major functions performed by Shop 38 personnel are aboard ship machining work and the dismantling, removal and reinstallation of equipment aboard ship. Outside Machinists install, repair, and modify antennas, catapults, arresting gear, and overhaul or repair diesel engines for surface craft and submarines. A portion of the diesel engine repair work is performed in Bldg 134, with the balance being performed aboard ship, or at dockside. Bldg 128 is the shop's principal base of operations. The types of equipment utilized in this work include portable milling, facing and boring machines. This equipment, however, belongs to Shop 06, and is utilized by Shop 38 personnel when needed.

Existing conditions have contributed to the following deficiencies in Shop 38:

- The areas assigned to Shop 38, both in Bldg 134 and at dockside, do not provide sufficient covered floor space for work on some of the larger assemblies, such as arresting gear, catapults and diesel engines. At present, much of this work is done in the open where inclement weather can hinder operations.

- Equipment which must be removed from the ships in order to permit access to work areas must be stored at dockside without security or control. In the case of submarine equipment such as periscopes and snorkels, this lack of security is a serious deficiency.

- The inconvenient location of Bldg 134 in relation to the waterfront area has resulted in excessive personnel travel time between this main facility and the waterfront worksites.

Support Machine Shop in Building	Equipment
225	lathe, drill press, bandsaw
208	same as for Bldg 225
230	lathe, milling machine, radial drill, drill press, surface grinder, bench grinder, bandsaw
134	same as for Bldg 230
368	same as for Bldg 230

These small support facilities will provide Shop 38 with needed work and storage spaces along the waterfront, minimizing the loss of productive time through excessive personnel travel between main facility and waterfront worksites; they will increase the capacity of the shop to do its proper light machining work rather than routing it to Shop 31; and simplify supervisory tasks.

- Procurement of one portable shop containing duplicate equipment as provided in Bldg 230 and capable of being moved to Alameda Naval Air Station for work aboard carriers as required.

- Purchase of 15 heavy and 25 light machine tools at a total acquisition cost of approximately $168,000.

d. Summary Tabulations

- Existing and recommended equipment are defined in Table V-6.

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6. Shop 38 - Weapons

a. Existing Conditions

The primary mission of the Weapons Shop, which is under Shop 38 cognizance in the Hunters Point Naval Shipyard, is to provide the resources necessary to remove, overhaul, repair, test and install guns, gun mounts, launchers, torpedo tubes, and other equipment normally considered a part of weapons workload.

The Weapons Shop presently occupies 17,000 sq ft on the ground floor of Bldg 253. The present space and configuration is inadequate to meet the projected workload for the Weapons Shop.

Present deficiencies noted in the Weapons Shop are as follows:

- Space limitations significantly affect the efficient use of manpower and equipment. The shop's space in Bldg 253 is in part utilized for antenna repair, which interferes with weapons repair activities. Workload forecasts in both antenna and weapons indicate a significant increase.

- Environmental controls are deficient per the requirements set forth by DM-28, requiring air conditioning, humidity, dust and contamination controls in all areas directly concerned with the overhaul, repair and test of fleet weapons systems.

- Security provisions for the repair of classified equipment are presently unsatisfactory.

- Production and test equipment are obsolete and inadequate to meet the increasing maintenance requirements of the fleet weapons systems and demands placed upon them by increased workload.

b. Current Planning by the Shipyard

The shipyard has requested two items of equipment through P-Sheets for hydraulic test stands.

c. Alternates Considered

- Alternate A - Expansion of the present Bldg 253 was considered and rejected, as expansion in the only direction possible would block access to the waterfront.

7. Shop 41 - Boiler

a. Existing Conditions

Shop 41 is responsible for the manufacture and repair of boilers and boiler components, condensers, floor plates, stacks and tanks. The shop is also responsible for performance checks on boilers and their components.

Equipment used by the shop includes pipe bending machines, plate shearing machines, plate formers, radial drilling machines, band saws, press brakes and welding equipment.

Shop 41 occupies 24,260 sq ft in Bldg 411 (Shipfitters Shop).

Existing conditions contribute to the following principal deficiencies in Shop 41:

- The equipment arrangement in the shop needs improvement. Steam cleaning is too close to spot welding, welding cables are laid across traffic aisles, and similar obstructions prevent smooth workflow.

- There is insufficient laydown and assembly area for efficient boiler retubing work.

b. Current Planning by the Shipyard

Five P-Sheets for new equipment have been prepared by the shipyard requesting band saws, a punching and coping machine, an end finishing machine, and a pump.

In addition, the shipyard has arranged for the transfer from Shop 17 to Shop 41 of a 10 ft by 1/4 in. shear, a punch and cope press, a radial drill and a 1/4 in. roll. This equipment has a low utilization in Shop 17 and is required in Shop 41.

c. Alternates Considered

The relocation of Shop 41 to another more suitable building was considered. However, this scheme has two limitations: First, Shop 41 should be close to Shop 11 because of the nature of its operations, and therefore should remain in Bldg 411, or nearby; and second, the savings

2. Shop 51 - Electrical

a. Existing Conditions

The primary mission of Shop 51 of the EWP/Electrical Group is the removal, overhaul, repair, test, and installation of motors, generators, control panels, switchboards, cables, batteries, and gyros.

The Electrical Shop presently occupies the following space:

BLDG	SQ FT
253	38,600
211	52,000
123	67,700
124	4,000
130	1,000
225	3,000
TOTAL	166,300

Shop activities are located principally on the ground floor of Bldg 211. The present space allocation is inadequate to meet the projected workload for Shop 51.

Deficiencies noted in Shop 51 include the following:

- Severe space limitations and widely separated work areas contribute significantly to inefficient workflow, excessive movement of in-process equipment, and inefficient use of space, manpower and equipment.

- Lack of monorail and bridge crane systems makes the movement of in-process heavy equipment difficult and time consuming.

- Environmental controls are inadequate or nonexistent in those shop areas requiring controlled atmospheric conditions. In accordance with DM-28, air conditioning, humidity, dust and contamination controls are required in all areas directly concerned with the overhaul, repair and test of precision equipment.

3. Shop 67 - Electronics

a. Existing Conditions

The primary mission of Shop 67 of the EWP/Electrical group is removal, repair, test, calibration, and installation of equipment for navigational aids, communications, radar, sonar, anti-submarine warfare, electronic countermeasures, identification-friend or foe, ground control approach, and other related functions.

The Electronics Shop presently occupies the following space:

BLDG	SQ FT
253	91,000
351	26,700
307	3,200
113	6,400
323	3,200
351A	18,500
TOTAL	149,000

Shop activities are located principally in Bldg 253. The present space allocation is inadequate to meet the projected workload for Shop 67.

Deficiencies noted in Shop 67 include the following:

- Severe space limitations and widely separated work areas significantly contribute to inefficient workflow, excessive movement of in-process equipment and inefficient use of space, manpower and equipment. In some cases functions are utilizing makeshift facilities; the teletype service, for example, is operated in a hallway and a washroom for lack of space.

- Lack of monorail and bridge crane systems makes the movement of in-process heavy equipment difficult and time consuming.

- Environmental controls are inadequate or nonexistent in those shop areas requiring controlled atmosphere conditions. In accordance with DM-28, air conditioning, humidity, dust and contamination controls are required in all areas directly concerned with the overhaul, repair and test of fleet electronic systems.

2. Shop 64 - Woodworking

a. Existing Conditions

Shop 64 at Hunters Point is responsible for woodworking, boat maintenance and repair, and plastics manufacturing functions. Plastics manufacturing and small boat repair and construction are performed in Bldg 366; woodworking in Bldg 363; and carpentry and drydocking shipwright work in Bldg 141. The shop presently occupies a total of 43,600 sq ft. The types of equipment used in the performance of Shop 64 work include woodworking machines, millwright equipment, plastic, fiberglass and resin molding equipment. The condition of equipment in the shop is generally fair.

There are sufficient production and support areas in the shop's three locations. However, the space allocated for shop stores is inadequate.

b. Recommendations

Although the existing facilities of Shop 64 are not ideally suited for their purposes, neither extensive modification of existing structures nor new construction can be economically justified. No shipyard MCON has therefore been generated. However, certain changes in the shop's functions, space allotment and equipment inventory are recommended to take place in FY 1, as follows:

- Relocation of the saw filing operations (presently performed in Shop 64 facilities under the cognizance of Shop 06) to Shop 06, Bldg 253, to achieve a consolidation of these operations. This relocation will release sufficient space in Bldg 366 to accommodate the rubber mill and rubber press equipment referred to in the next recommendation.

- Transfer of the rubber manufacturing operation now under Shop 56 (Pipe & Copper) to Shop 64, Bldg 366. This transfer will enable Shop 64 to combine the closely-related rubber and plastics manufacturing processes, and by so doing reduce the personnel requirement and make use of common skills.

- Return to Shop 64 of the tile setting function which is now under the cognizance of Shop 72 (Riggers and Laborers). This function should be located immediately adjacent to Bldg 366 in a relocated Butler building. The Butler building will become available as a result of implementation of Shop 17 modernization plan.

3. Shop 71 - Paint

a. Existing Conditions

Shop 71 provides painting and paint preparation services for the entire shipyard. Functions include surface preparation by pickling or sandblasting, manual painting and spray painting.

Shop 71 occupies a total of 25,600 sq ft of space, principally in Bldg 270 and in nine other buildings. The projected workload for the Paint Shop through 1974 indicates a requirement for 56,000 sq ft for Shop 71 operations.

Principal deficiencies noted in Shop 71 are:

- Inadequate production space to meet the projected workload.
- The sandblasting operations are currently housed in Bldg 812 and 319, located within the area designated for personnel housing. These buildings are consequently scheduled to be demolished or abandoned. Furthermore, the sandblasting equipment in these buildings is worn out and inadequate to meet workload requirements, particularly in view of the new shipyard responsibility for cleaning and restoring "S" band antennas.
- The present system of cleaning and painting steel plates and shapes is by pickling and hand spray painting. This requires more labor than does the modern equipment now available.

b. Current Planning by the Shipyard

One shipyard P-Sheet has been generated for the acquisition of a walk-in blasting booth (P90-66, Rev. 1) at a cost of $20,000.

c. Recommendations

Facility recommendations for Shop 71 are formulated as MCON P-182, FY 2, Steel Preparation and Painting Facility; and P-164, FY 1969, Antenna Abrasive Cleaning Unit (see Appendix A to this volume of the report). The facility and equipment recommendations include the following:

- For modernization of the cleaning and painting facilities for steel plates and shapes, construct a 100 ft by 30 ft sheet steel building at the site of the present plate racks bounded by Hussey, Spear, Cochrane, and Manseau Streets. Install a wheelabrator - paint spray operation running north-south in the yard west of "I" Street, and install a north-south spur track leading to the entry side of the wheelabrator. Purchase a "travel-lift", straddle truck to unload painted plates or shapes from the delivery side of the wheelabrator to a flat-bed truck or railroad car for transfer to Yard 411. These facilities, which will cost approximately $490,000, will provide annual savings of $68,000, as compared to present operations. The present value of the benefits is estimated to be $600,000, resulting in a profitability index of 1.2 for this proposal. It is therefore economically justified.

- Maintain the pickling operation at Yard 411 for infrequent pickling requirements.

- Increase the total space for Shop 71 from 25,600 sq ft to 56,000 sq ft by moving the main shop from Bldg 270, which will be demolished to make room for the projected new EWP/Electrical Building, into Bldgs 128, 261, 271, 275, 324, 351, 369, 415, the new Wheelabrator Building (MCON P-182, FY 2), and the new Sheetmetal Shop Building (MCON P-180, FY 1).

- In order to meet sandblasting workload requirements and to fulfill the recently assigned requirement for restoring "S" band antennas, construct a new 1920 SF "Vac-U-Blast" facility of steel frame and metal siding with standard sandblasting and recovery equipment. This cleaning unit is estimated to cost $200,000.

d. Summary Tabulations

- Existing and recommended equipment are tabulated in Table V-13.

5. Shop 99 - Temporary Services

a. Existing Conditions

Shop 99 is responsible for the installation, maintenance and removal of temporary service equipment and facilities for shops performing dockside work. The equipment and service facilities include pumps, fans, tanks, lighting and heating fixtures, refrigerators, blowers, exhausters and oxygen and acetylene lines.

Shop 99 is located in Bldg 251, with minor support facilities in Bldg 128 and 272 and occupies a combined total of 28,100 sq ft of covered floor space.

Principal deficiencies noted in Shop 99 are:

- Maintenance work and material storage operations are impaired by inadequate space in the shop's central facility.
- The shop facility in Bldg 251 is generally in poor condition and the present lighting system is substandard.

b. Recommendations

The facility renovation described below is included in Repair Projects. The recommended upgrading of the lighting and power system is included as a part of MCON P-166, FY 2, Building Modernization - Lighting and Power. (See Appendix A to this volume of the report.) Recommendations are as follows:

- Renovation of the Bldg 251 facility, including needed painting and repair of electrical wiring, plumbing, doors, windows, and floors. The total cost of these recommended facility repairs is approximately $128,000.
- Installation in Bldg 251 of a lighting and power system that is compatible with modern industrial standards, at an estimated cost of $106,000.
- Rearrangement of the shop's facilities in Bldg 251 to utilize the total square footage available in that structure. The proposed relocation of Shop 06 (Central Tool) to another building will make 19,000 sq ft of space available. This change will provide work and storage space sufficient for the shop's current and projected needs.

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F. DISPOSAL AND WASTE TREATMENT SYSTEMS

1. Sanitary and Storm Sewers

a. Existing Conditions

The sanitary and storm sewer systems at the shipyard normally convey storm runoff to San Francisco Bay, and sanitary and industrial wastes to the San Francisco City sewer system. As presently installed, the systems have the following principal deficiency:

- The sanitary and industrial discharge is combined with the storm runoff and the shipyard sewer system has insufficient hydraulic capacity to handle peak sewage loads. Diversion structures are of necessity used during peak demand to dump the excess, containing raw sewage, directly into San Francisco Bay. This means of disposal is in violation of Executive Order 11288 of 2 July 1966, and City of San Francisco Ordinance No. 7425 of 3 July 1953. However, with the present sewage disposal system, Hunters Point has no other recourse, for the treatment plant of the City of San Francisco cannot handle the large storm flows from the shipyard storm sewers during the peak rainy season.

b. Recommendations

To comply with existing regulations prohibiting sewage disposal in San Francisco Bay, and to avoid overloading San Francisco's treatment plant, it is recommended that the solutions developed by Kennedy Engineers, independently of this study, be put into effect. Two new, separate systems, with a total of 44, 700 lin ft of piping, should be constructed at Hunters Point Naval Shipyard. The recommendations, formulated as MCON P-175 for FY 1 (see Appendix A to this volume of the report), in the amount of $4, 370, 000, include the following:

- Install a new sanitary sewer system consisting of 35, 690 ft of standard sewer pipe, complete with fittings, manholes, and pumps.

- Install a storm sewer system consisting of 8, 985 ft of standard storm sewer pipe of appropriate sizes, with fittings and manholes at various locations throughout the shipyard.

2. Oil Reclamation System

a. Existing Conditions

The oil reclamation system at Hunters Point receives and disposes of oily waste mixtures from ships assigned to the shipyard, from the various shops, and from Treasure Island and Alameda Naval Air Station. In addition, it receives wash water from ship and shipyard tank cleaning operations. Built in 1944, the plant is located near the southwest shoreline of the shipyard and consists of two slush oil lakes, piping, and related equipment. The system's maximum storage capacity is 8,000 barrels.

Existing conditions have contributed to the following deficiencies in the oil reclamation system:

- Oil leaches through the system dikes into the bay in violation of local anti-pollution regulations.

- The water that is pumped into the bay from the lakes contains oil in excess of the 20 mg/liter limitation set by local regulations. Furthermore, during heavy rains the level of the open ponds rises at a rate which exceed the rate at which the existing pumps can dispose of the water. Consequently the surface oil in the ponds overflows into the bay.

b. Alternates Considered

The addition of chemical treatment units to the present system was considered but rejected for the present because of the structural complications and expense involved. Steam treatment of the oily waste mixtures was found to be an appropriate and economical solution.

c. Recommendations

Recommendations call for steam treatment facilities and are formulated as MCON P-155, FY 1, in the amount of $89,000 (see Appendix A to this volume of the report). These recommendations include the following:

- Construction of two 5,000 barrel, open, prefabricated steel tanks, covered by a shed, and heated by steam coils fed from the shipyard steam system. Installation of related valves and steam piping.

- Installation of dual-purpose transfer pumps to put a suction on the existing eight-in. receiving line from Berth 29 to the plant and to discharge processed water to sewer connections.

- Replacement of the 2,400 ft long oil transfer line from Berth 29 to the reclamation plant with new piping.

The location of the proposed oil reclamation plant is depicted in Figure VI-4.

The proposed new oil reclamation plant, with its increased capacity, will eliminate the bay water pollution problems created by the present system, and will have the capacity to handle the projected workloads. Moreover, this new system can easily be adapted to accommodate additional chemical treatment units, as and when required by future anti-pollution regulations.

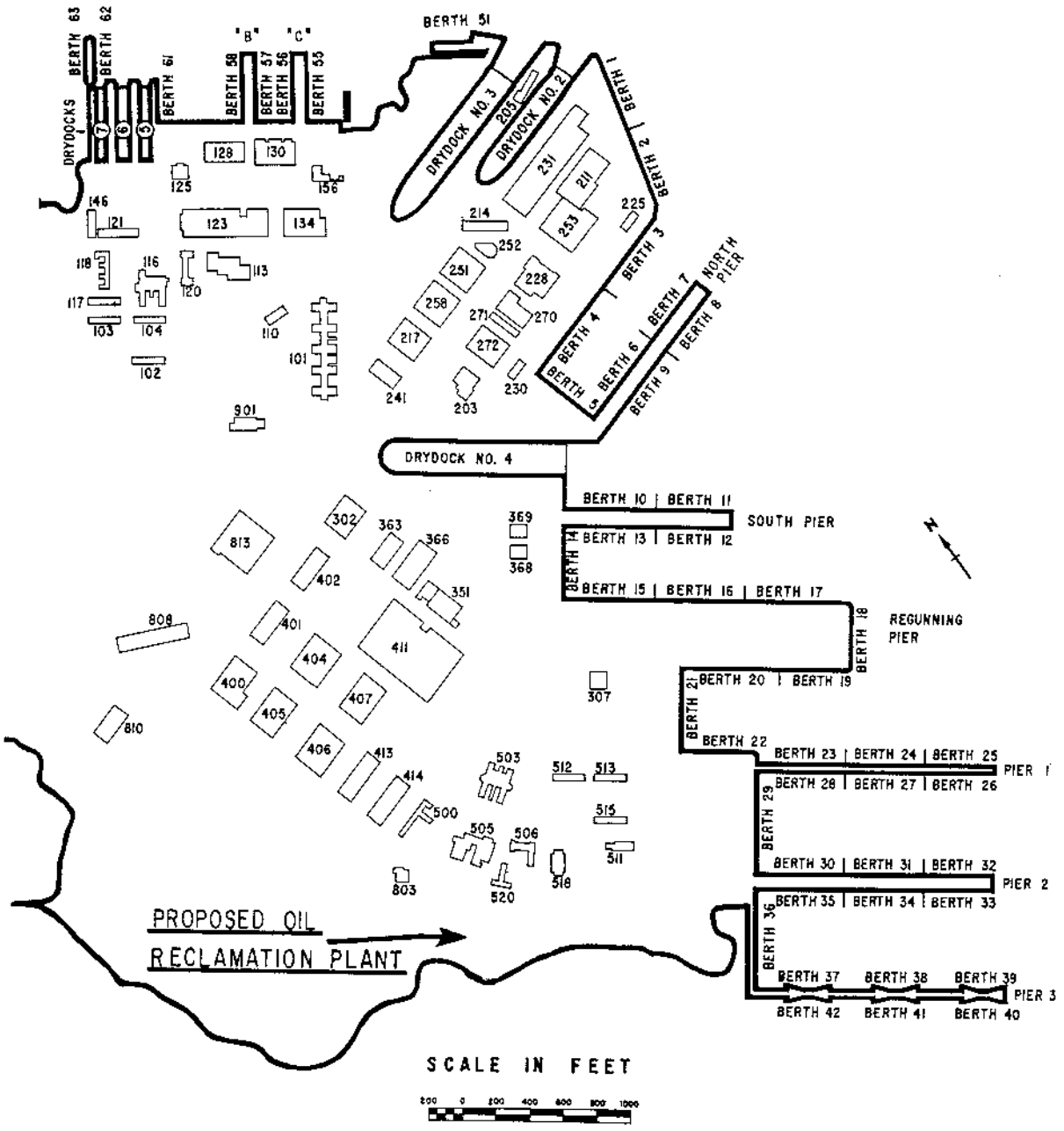

FIGURE VI-4

SAN FRANCISCO BAY NAVAL SHIPYARD

HUNTERS POINT SITE

OIL RECLAMATION SYSTEM

PROPOSED MODERNIZATION PLAN

B. ENGINEERING AND MANAGEMENT FACILITIES

1. Existing Facilities

The principal engineering and management facility at the shipyard is Bldg 101, an overcrowded, two-story, wood frame structure built in 1943. Due to lack of space in this building, administrative personnel are also housed in seven other Bldgs: 102, 114, 121, 214, 251, 507 and 813. These additional facilities include a warehouse, the mezzanine of an industrial shop, and barracks buildings. The eight separate locations inhibit inter-office communication and orderly workflow. Moreover, Bldg 101 is in need of extensive modernization: operations within the building are excessively divided and extensive combustible partitions constitute a fire hazard.

2. Analysis and Recommendations

Three alternate engineering and management facilities plans were considered:

- Alternate A encompasses construction of a 107,000 sq ft annex to existing Bldg 101 to relieve crowded conditions and to house design personnel presently in the substandard barracks facility (Bldg 114); and repair and modernization of existing administrative facilities in Bldg 101, 102, 251, 507 and 813. Estimated cost of these changes is $4,600,000, and this alternate was used as a basis for savings comparison.

- Alternate B encompasses construction of a new, 333,000 sq ft, multi-story administrative facility in the Submarine Base area (where existing barracks are to be demolished) at an estimated cost of $8,500,000. The annual savings which would be realized through implementation of this alternate (as compared to the cost of operations under Alternate A) are estimated to be $1,000,000; the present value of these annual benefits is $8,500,000. Since the net additional investment is $3,900,000 (cost of Alternate B less the cost of Alternate A), this alternate has a profitability index of 2.2.

- Alternate C encompasses construction of a new, 333,000 sq ft multi-story administrative facility on the site of existing Bldg 101 at an estimated cost of $8,600,000. The annual savings which would be realized through implementation of this alternate (as